

REMARKS

in response to the Final Office Action mailed June 24, 2005, Applicants respectfully request reconsideration in light of the foregoing amendments to the claims and the following remarks, and the attached one month request for extension of time to respond.

Claims 1 to 12 are presented for reconsideration.

Claims 1, 6, 7, 10 and 11 stand rejected under 35 USC §102(b) as being anticipated by Forg et al.

The Examiner contends that Forg et al. show a system for removing a nitrogen enriched stream from the top of a double rectification column 35, 29 and a liquid enriched methane stream from the bottom of the column. Valve 42a as discussed in lines 42-57 of column 5, allows feed from line 1 to be mixed with the exiting nitrogen enriched stream to conserve a desired minimum methane concentration. In regard to claim 7, the vapor is raised in pressure by compressor 41.

Applicants contend that the invention as claimed is not anticipated by Forg et al. The Examiner has interpreted the liquid fraction collected in the phase separator 27 as part of the 'feed natural gas'. It is however, a liquid fraction that is condensed out of the feed natural gas.

Applicants contend that part of the feed gas in claim 1 does not encompass any higher boiling liquid hydrocarbons that are condensed out of the gas. The reference in Applicants' claim to the "part of the feed gas" should be interpreted as a part of the feed gas stream upstream of its cryogenic separation.

The final clause of Applicants' claim 1 claims that the introduction of the "part of the feed gas" stream into a secondary nitrogen-enriched product stream is "so as to restore its mole fraction of methane". "Restore" in this context means increase because according to the claim the mole fraction of methane in the secondary nitrogen-enriched product stream has fallen.

The Examiner has particularly directed Applicants' attention to column 5, lines 42 to 47 of Forg et al. This passage refers to the flow of a gaseous stream which is "withdrawn from the head of the upper column". Applicants contend that because of the position of this stream that the Examiner is equating this to the claimed secondary nitrogen-enriched product. The gas stream withdrawn from the head of the upper column is according to the cited passage mixed with boil off from the storage tank 39. According to the final sentence of the cited passage, 'in order to adjust the heating value of this gaseous mixture to that of natural gas, there are added via valve 42(a) higher boiling hydrocarbons previously condensed during the course of the precooling step." Underlining added by Applicants.

Methane is the lowest boiling of all hydrocarbons. Claim 1 requires the mole fraction of methane in the secondary nitrogen-enriched product stream to be increased. However, the addition of the higher-boiling hydrocarbons will not have that result. On the contrary, their addition will further dilute the methane in the secondary nitrogen-enriched product and therefore reduce its mole fraction. This is not what Applicants claim. Accordingly, Forg et al. does not anticipate claim 1. Reconsideration and reversal of this rejection are respectfully requested.

Claims 2, 3, 8 and 9 stand rejected under 35 USC §103(a) as being unpatentable over Forg et al. in view of Butts.

The Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of Applicant's invention from the teaching of Butts to modify the separation system of Forg et al. by using a Joule-Thomson valve to provide the

refrigeration for the separation to provide cooling due to rapid expansion which will assist in the separation process by cooling the rapidly expanding gas to promote condensation of the less volatile constituent.

Applicants contend that the invention as claimed in claims 2, 3, 8 and 9 is not obvious over the combination of Forg et al. in view of Butts. As submitted above, Forg et al. does not show each and every element of the claimed invention. On the contrary, Forg et al. does not teach that a portion of the feed gas is introduced into the secondary nitrogen-enriched product stream so as to restore its mole fraction of methane to the chosen minimum value or a value thereabove. The valve 42a is employed to allow previously condensed hydrocarbons to pass through into the fresh natural gas feed from the conduit 40a. This addition will dilute the methane in the secondary nitrogen-enriched product and reduce the methane mole fraction therein.

Forg et al. relies on the fractional condensation of hydrocarbons to provide refrigeration and does not suggest looking to a reference using a Joule-Thomson valve to provide the same. Butts provides cooling and pressure reduction to achieve optimum nitrogen and hydrocarbon separation within the separator column by use of a Joule-Thomson valve and primarily relies on heat exchangers once steady state operation is achieved to achieve this cooling.

Since Forg et al. does not teach or suggest Applicants' claimed invention, there is no incentive to utilize a Joule-Thomson valve to achieve cooling per the teachings of Butts. Reconsideration and reversal of this rejection are respectfully requested.

Claim 4 stands rejected under 35 USC §103(a) as being unpatentable over Forg et al. in view of DeMarco.

The Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of Applicant's invention from the teaching DeMarco to modify the separation system of Forg et al. by using an expansion engine to provide the

refrigeration for the separation to provide cooling for the system while recovering work (using the attached generator).

Applicants contend that their invention as claimed in claim 4 is not obvious over the combined teachings of Forg et al. and DeMarco. Applicants maintain that Forg et al. neither identically discloses nor teaches their invention particularly as to diverting a part of the feed gas into the secondary nitrogen-enriched product stream so as to restore its mole fraction of methane to at least a minimum value.

As such, there is no incentive for Applicants to look to another reference for cooling means as DeMarco as well does not teach or suggest their invention. Although DeMarco shows the use of an expansion engine to provide refrigeration, this reference also fails to teach or identically disclose Applicants' claimed invention. There would be no reason for Applicants to combine two different processes to realize that expansion engines will provide refrigeration in their nitrogen rejection method. Reconsideration and reversal of this rejection are respectfully requested.

Claim 5 stands rejected under 35 USC §103(a) as being unpatentable over Forg et al. in view of Butts as applied to claims 2, 3, 8 and 9 above and further in view of DeMarco.

The Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of Applicant's invention from the teaching DeMarco to modify the separation system of Forg et al. by using an expansion engine to provide the refrigeration for the separation to provide cooling for the system while recovering work (using the attached generator).

Applicants submit that their invention as claimed in claim 5 is not obvious over the teachings of Forg et al. in view of Butts and further in view of DeMarco. Applicants contend that both DeMarco and Forg et al. fail to teach or disclose the invention as claimed. Accordingly, they would not look to either of these references for their source

of refrigeration, nor would they then look further to combine them with a third reference, in Butts to derive their invention. The choice of two refrigeration methods of claim 5 is not taught by this combination of references. Reconsideration and reversal of this rejection are respectfully requested.

Claim 12 stands rejected under 35 USC §103(a) as being unpatentable over Forg et al in view of McNeil et al.

The Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of Applicant's invention from the teaching of McNeil et al. to modify the separation system of Forg et al. by using a pump to remove the liquid product from the column to provide high pressure product.

The invention as claimed in claim 12 is not obvious over the combination of Forg et al. in view of McNeil et al. As Applicants have contended above, Forg et al. fails to identically disclose the claimed invention as this reference does not disclose that a part of the natural gas feed stream is introduced into the secondary nitrogen-enriched product stream so as to restore its mole fraction of methane to the chosen minimum value or a value thereabove.

This is a different process from what is claimed by Applicants who utilize the pump as claimed in claim 12 in conjunction with their rejection process for withdrawing the primary product stream (methane) from the lower pressure rectification column and for raising the primary product methane stream pressure. McNeil et al. teaches that the bottoms from the column 10 are carbon dioxide and heavy hydrocarbons and are recovered in line 14. This joins in with line 35 which is primarily methane, which is then cooled in subcooler 13, then pumped via pump 36 into a main heat exchanger 2 and delivered via line 37 to be mixed with the compressed methane for use as a product sales gas.

Because Applicants achieve their result in a manner different from Forg et al., there is no motivation to look to McNeil et al. for a pump that can be used to increase the pressure of the product gas. This is not sufficient to obviate the claimed invention. Reconsideration and reversal of this rejection are respectfully requested.

For these reasons, Applicants respectfully submit that their invention as claimed defines patentable subject matter and is in condition for allowance.

The Examiner is invited to call the undersigned should any issue arise during the reconsideration of this application.

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Enclosures

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Respectfully submitted,

A handwritten signature in black ink, appearing to read 'PH HV-28', is written over the printed name of Philip H. Von Neida.

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